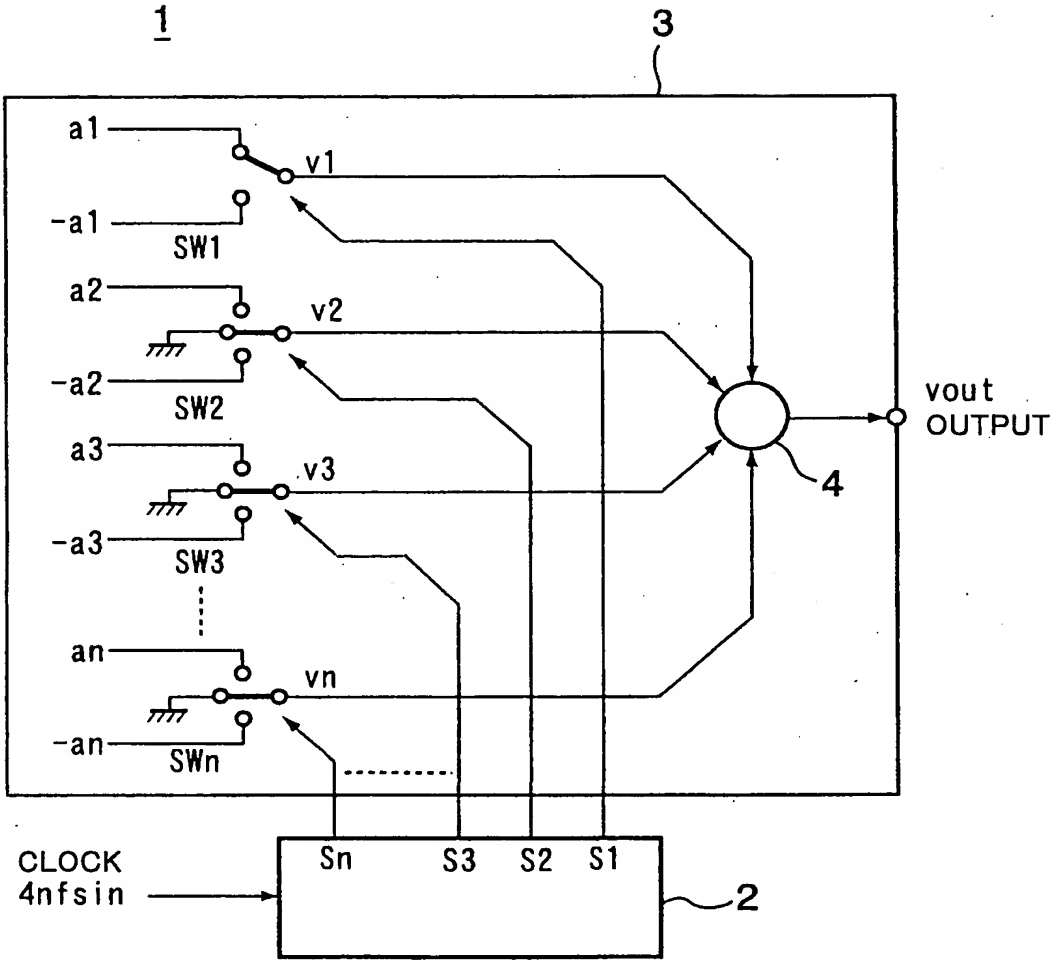
FIG. 1



1 ---- SINE WAVE GENERATION CIRCUIT

3 ---- VOLTAGE OUTPUT CIRCUIT

SW1 ~ SWn ---- COEFFICIENT GENERATION CIRCUIT

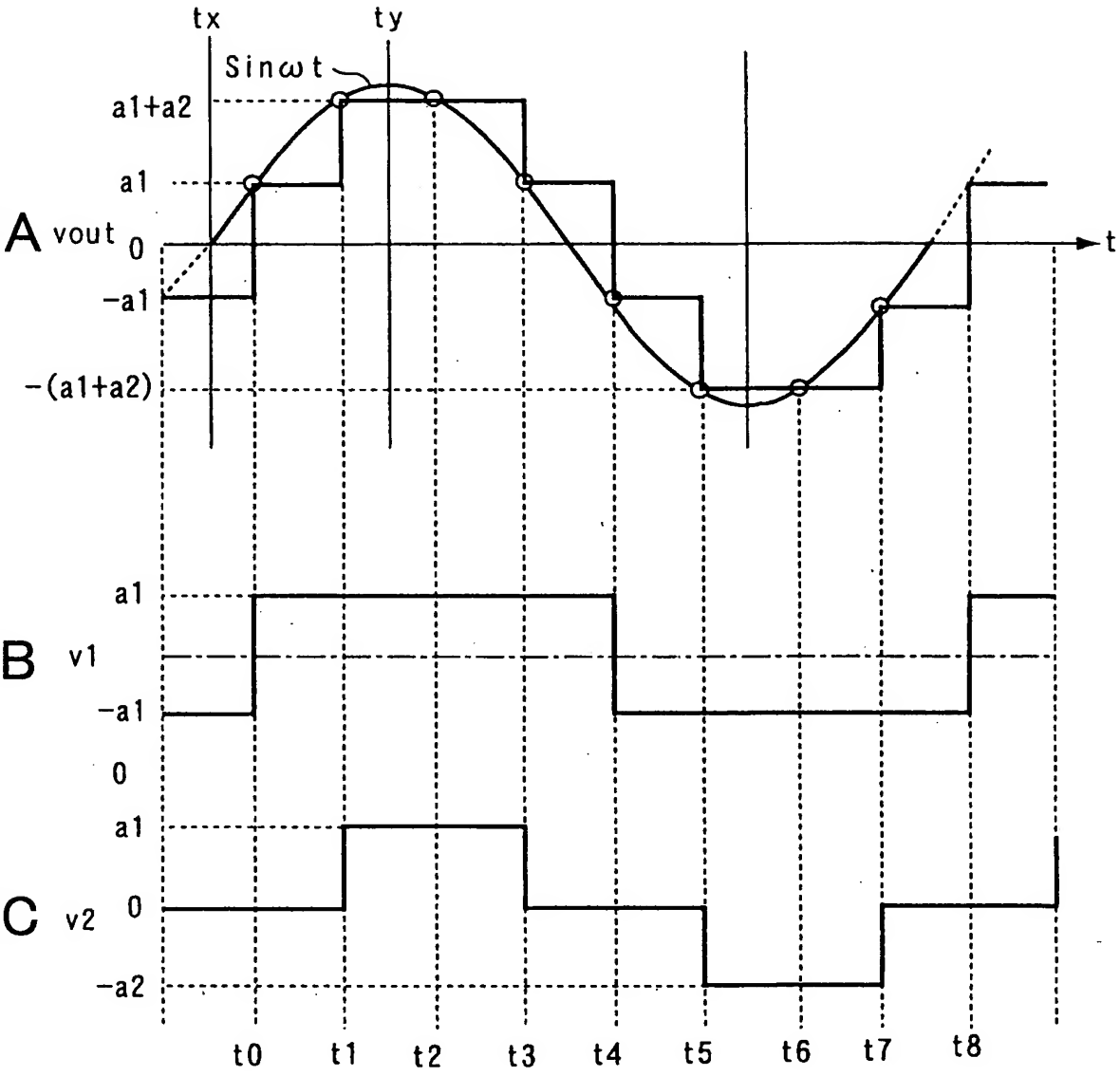


FIG. 2A

FIG. 2B

FIG. 2C

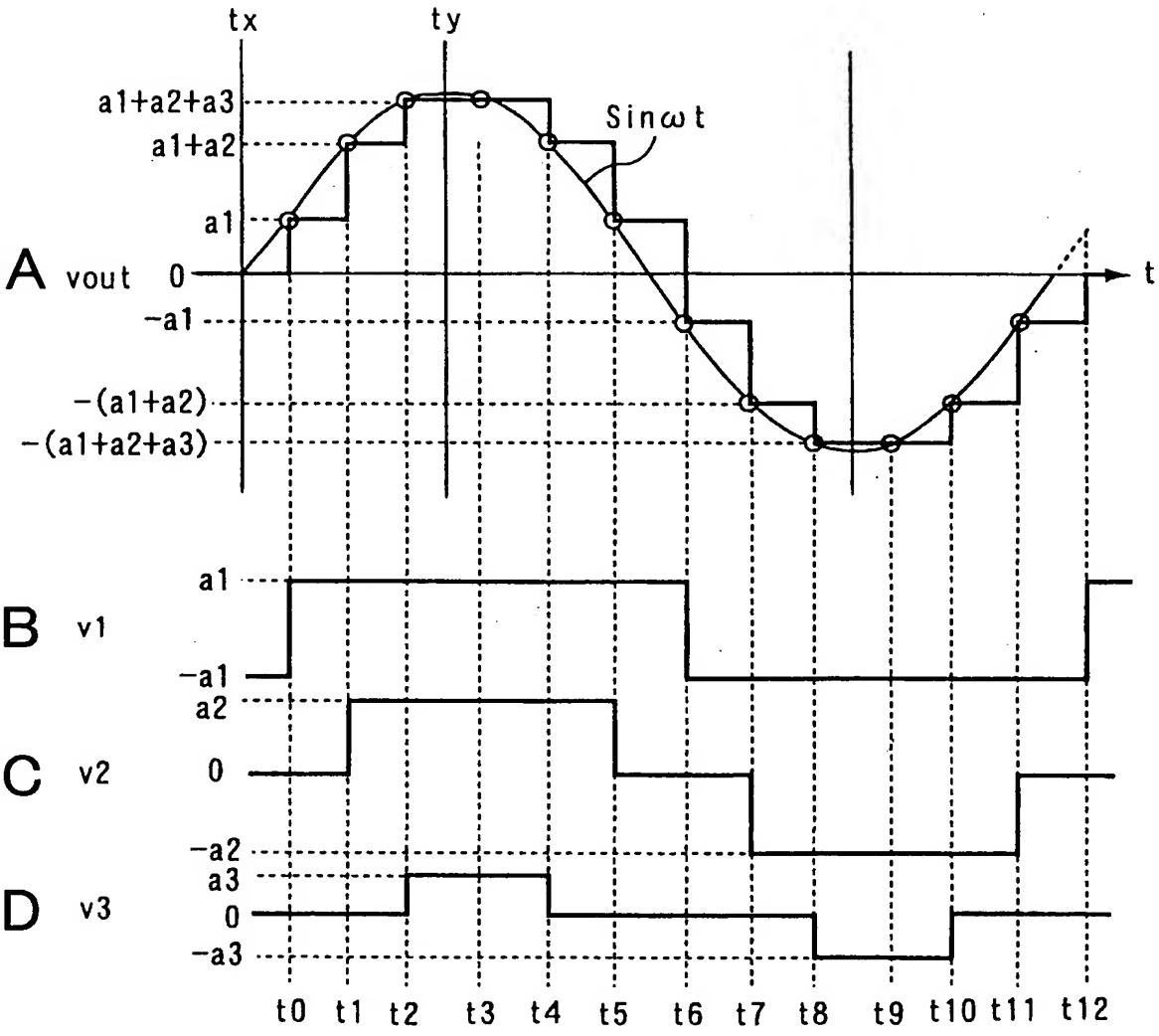


FIG. 3A

FIG. 3B v1

FIG. 3C v2

FIG. 3D v3

FIG. 4A

FIG. 4B

FIG. 4C

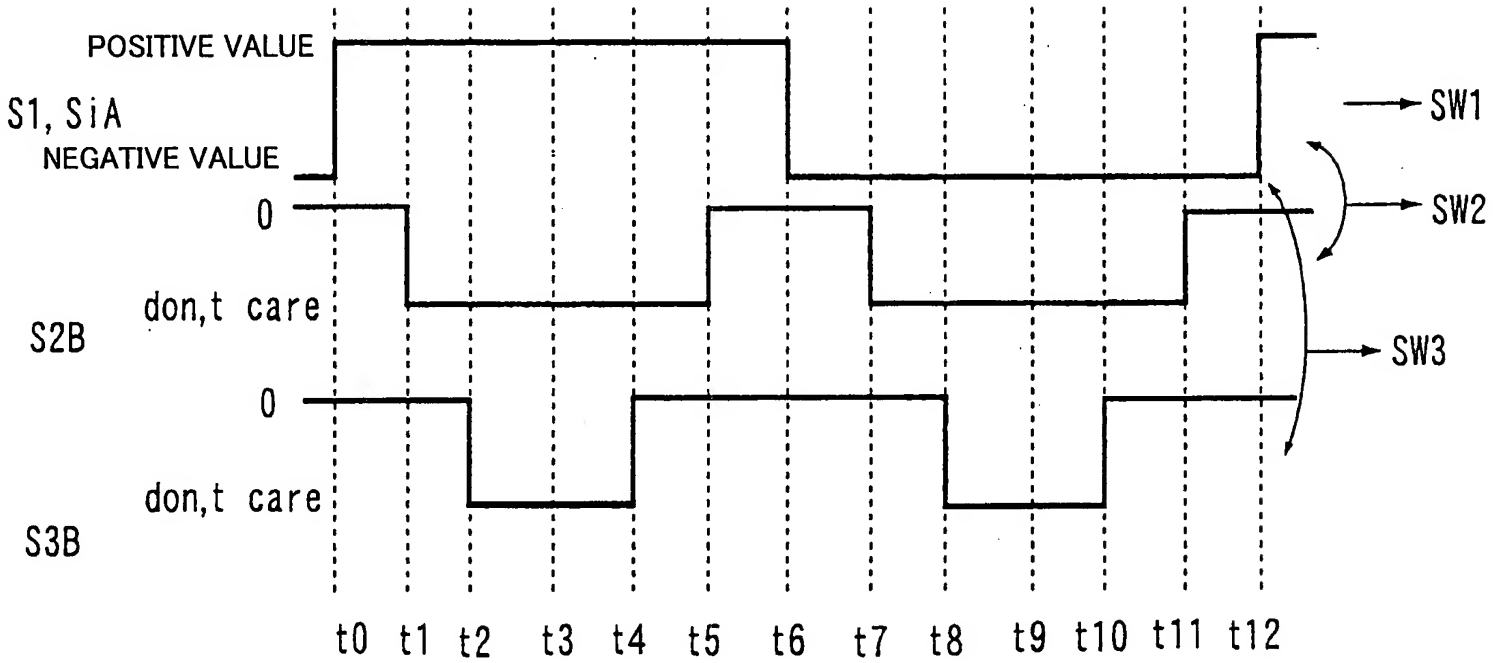


FIG. 5

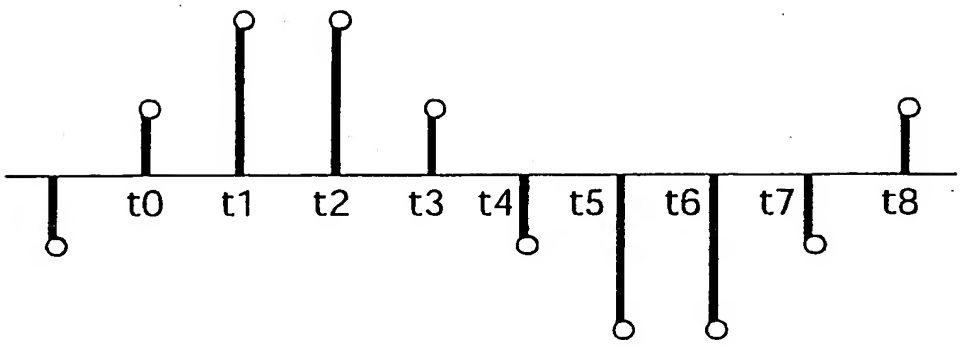


FIG. 6A

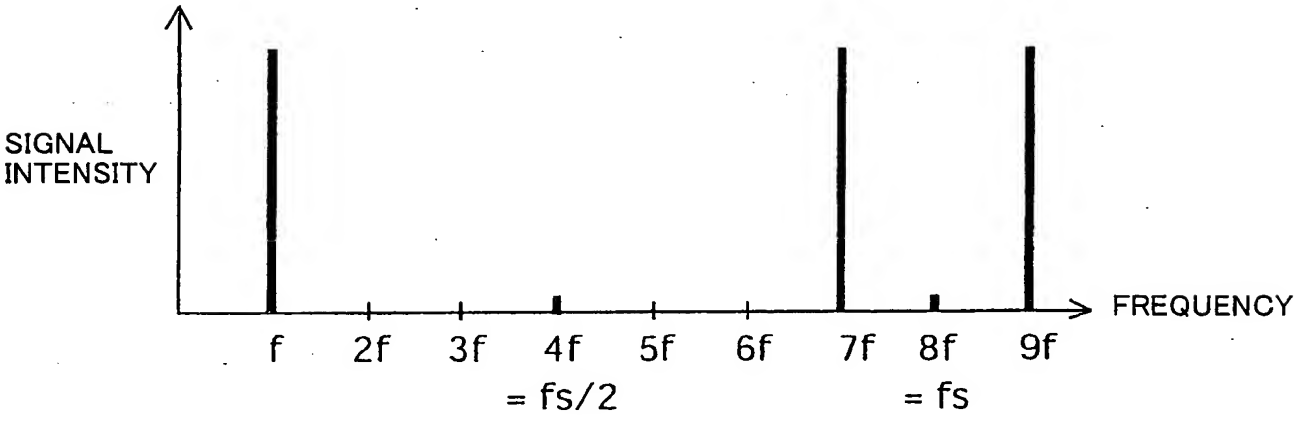


FIG. 6B

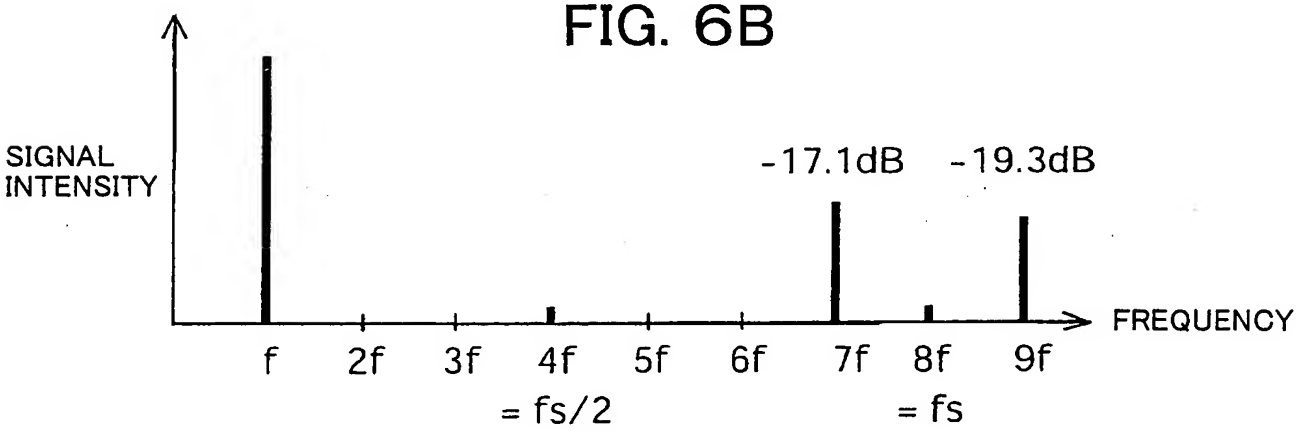


FIG. 7

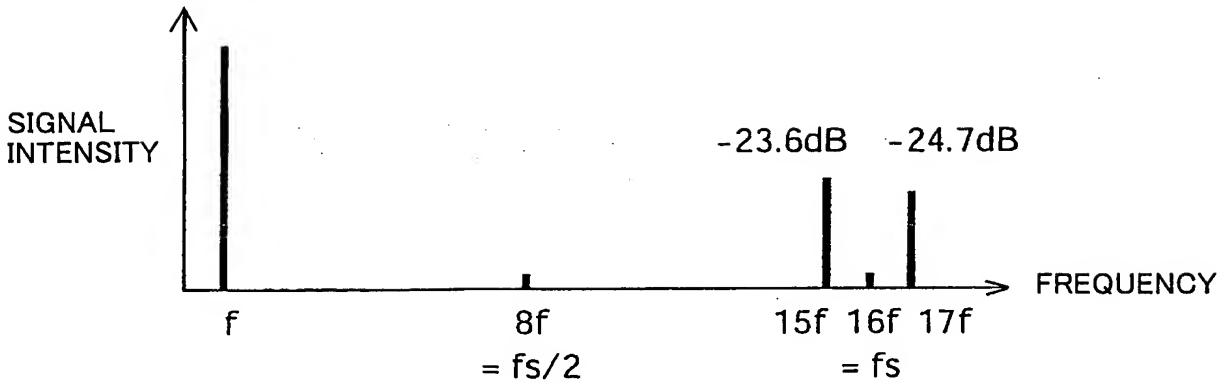

SIGNAL
INTENSITY
-23.6dB
-24.7dB
FREQUENCY
f
8f
= fs/2
15f
16f
17f
= fs

FIG. 8

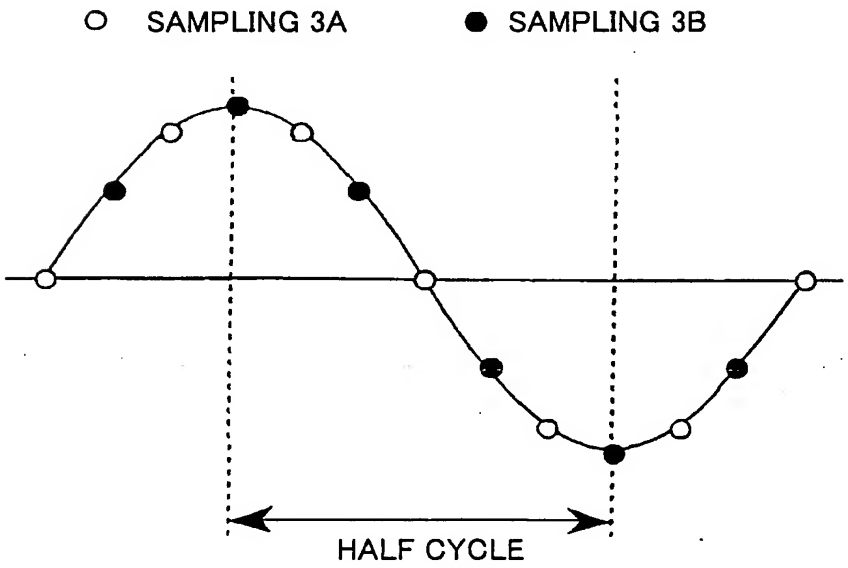

SAMPLING 3A
SAMPLING 3B
HALF CYCLE

FIG. 9

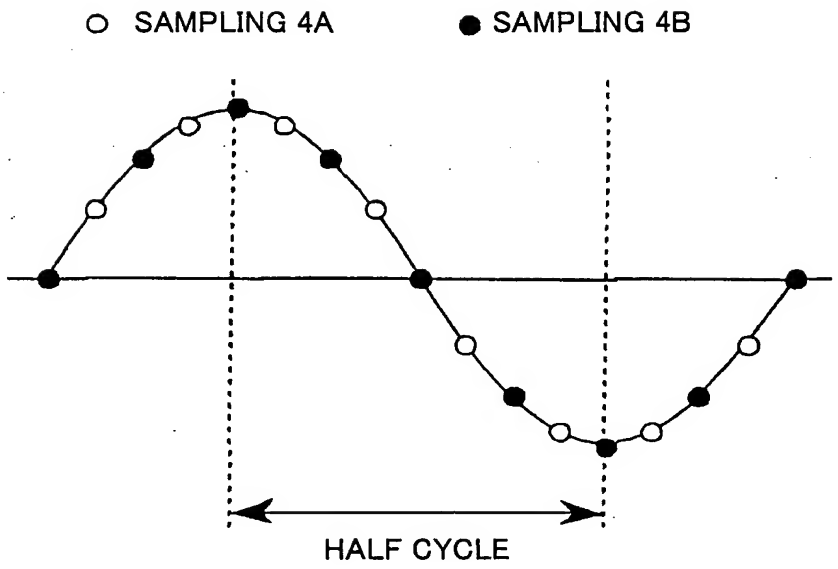
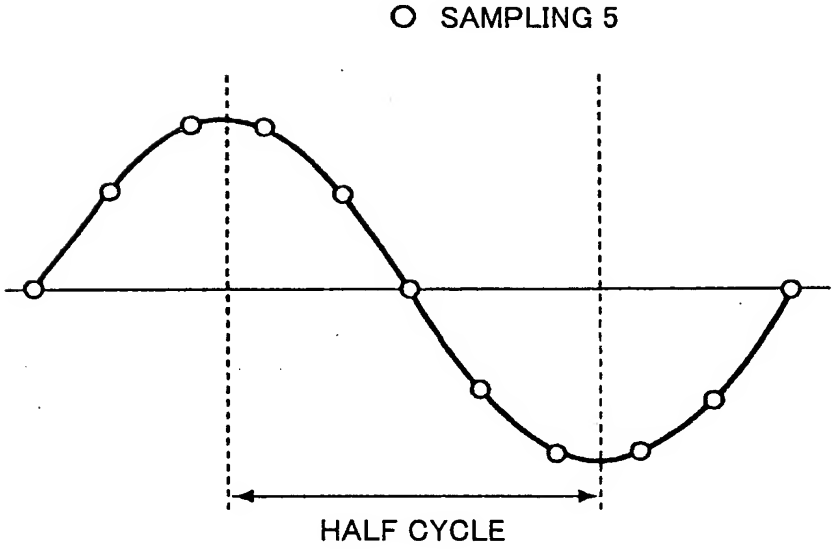
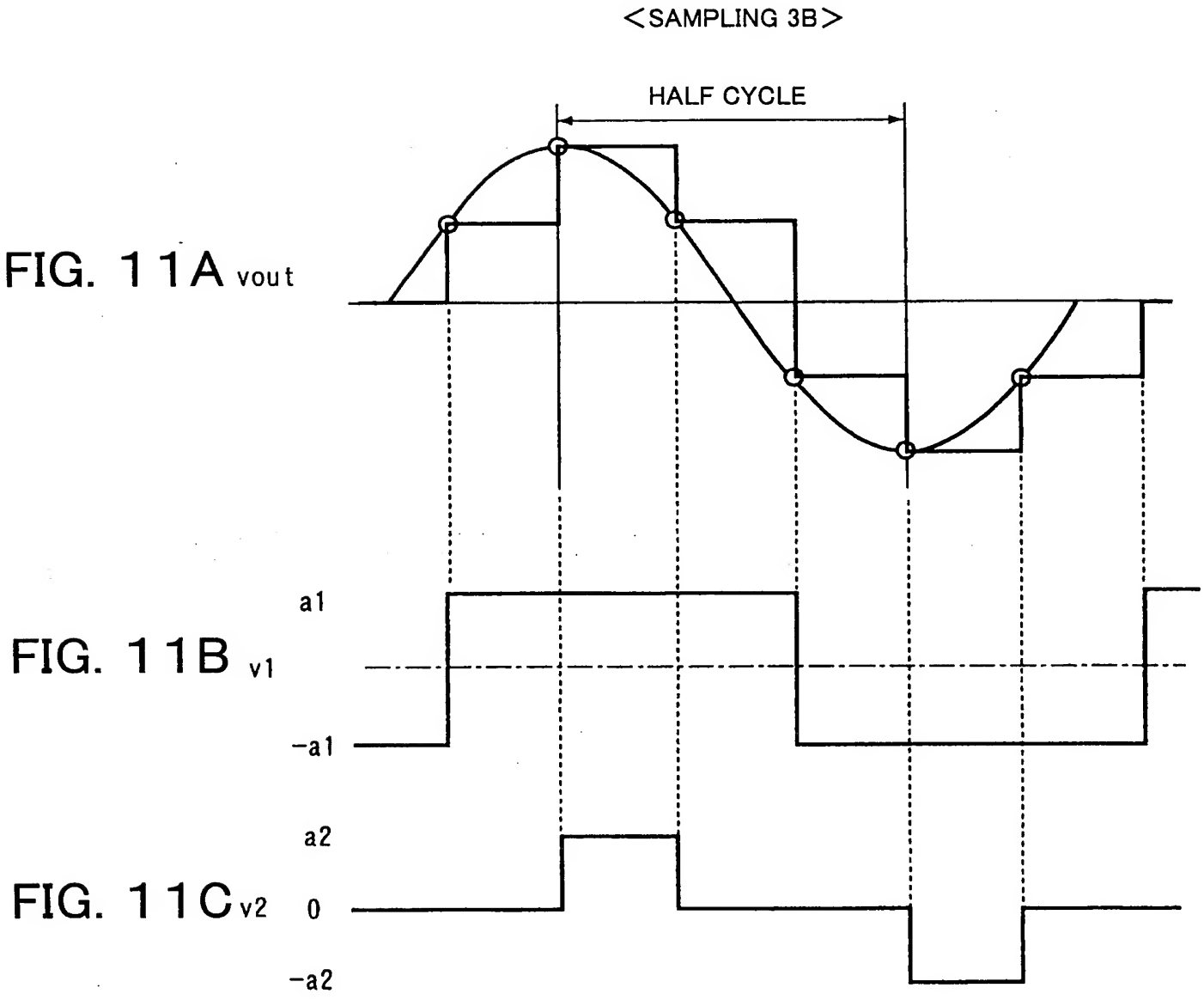


FIG. 10




<SAMPLING 3B>
HALF CYCLE
FIG. 11A vout
FIG. 11B v1
a1
-a1
FIG. 11C v2
a2
0
-a2

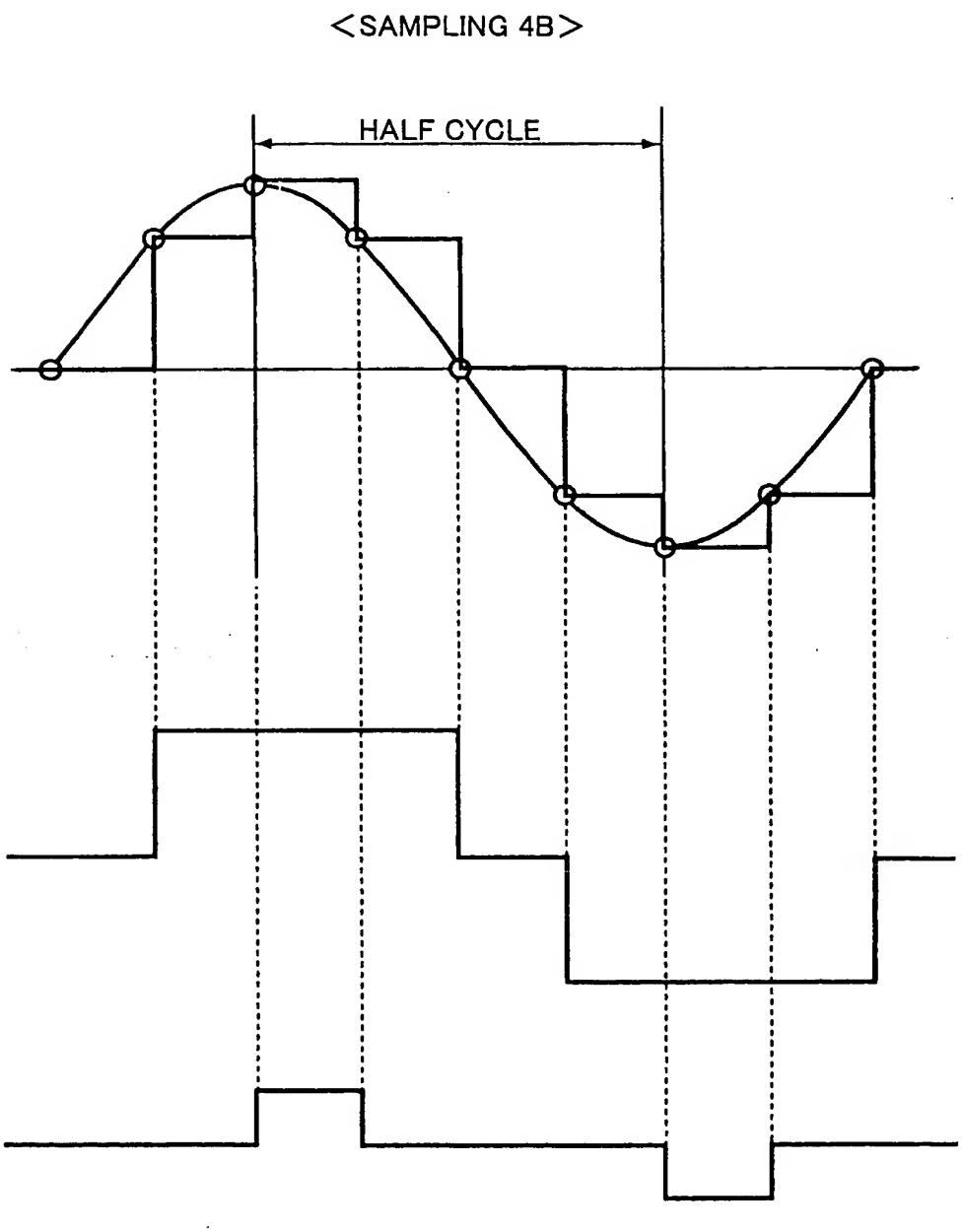


FIG. 12A vout

FIG. 12B v1

FIG. 12C v2

<SAMPLING 5>

FIG. 13A

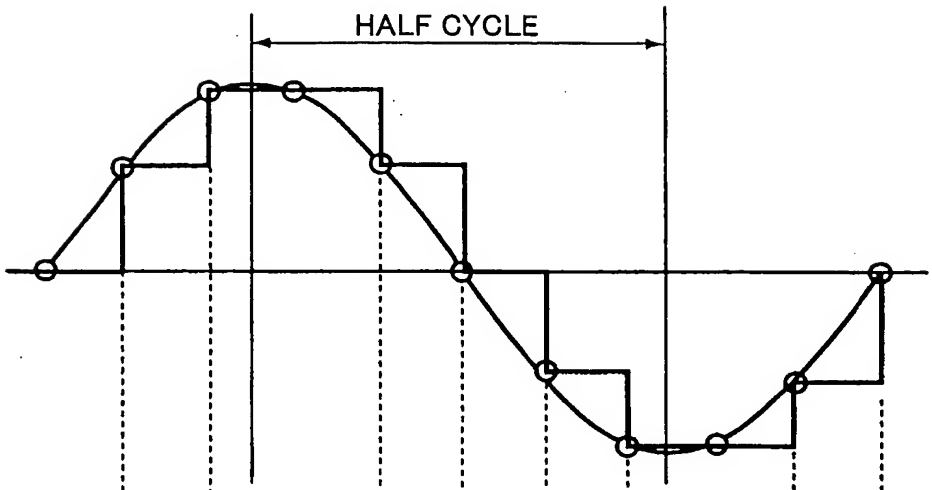


FIG. 13B

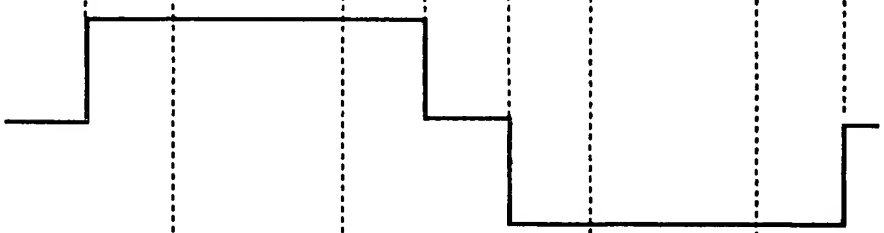


FIG. 13C

FIG. 14

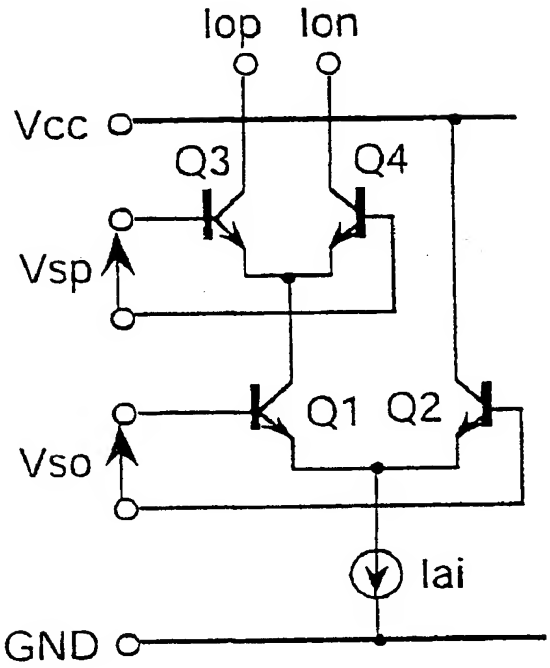

Iop
Ion
Vcc
Q3
Q4
Vsp
Q1
Q2
Vso
Iai
GND

FIG. 15

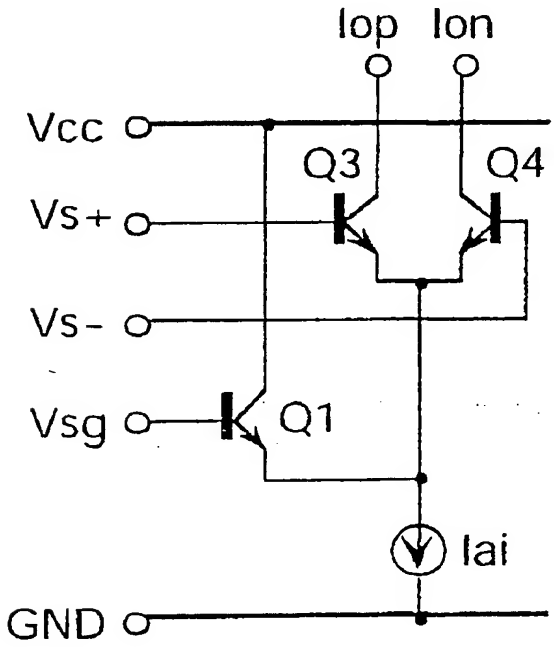

Iop
Ion
Vcc
Q3
Q4
Vs+
Vs-
Vsg
Q1
Iai
GND

FIG. 16

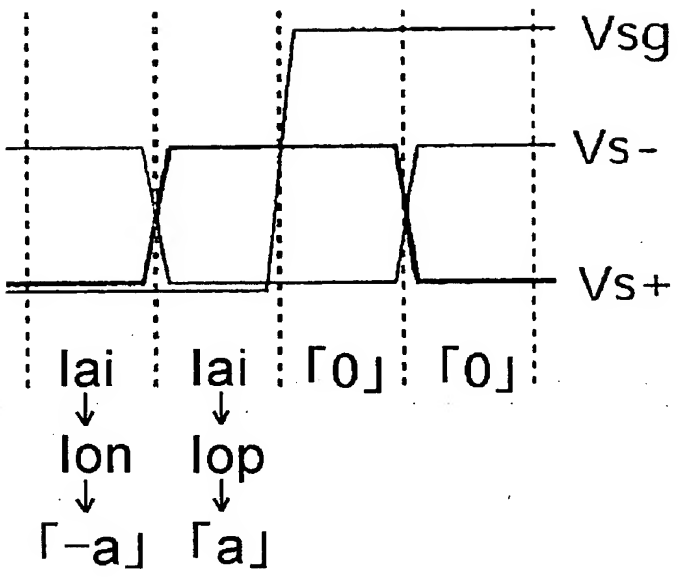
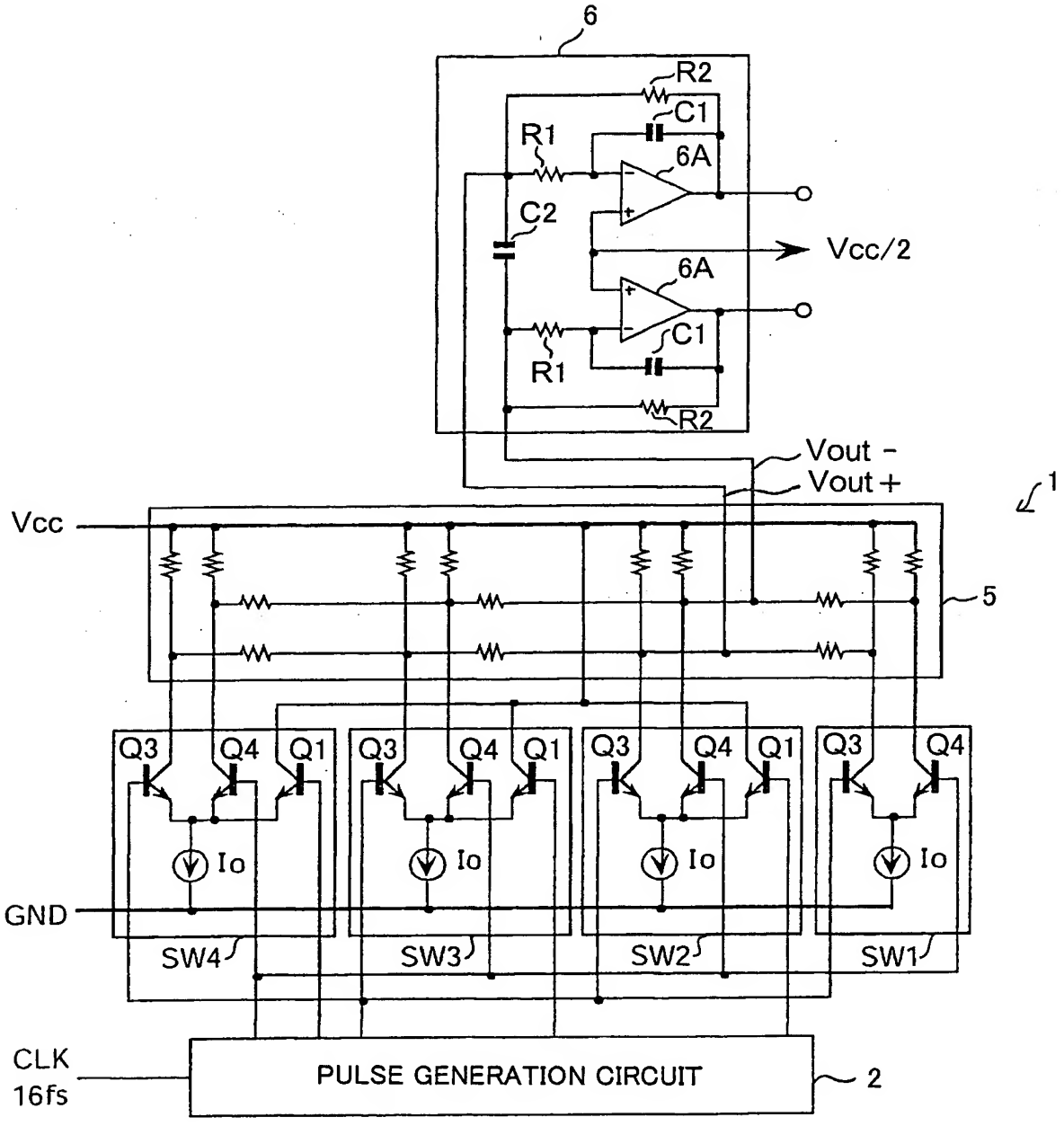


FIG. 17



1··· SINE WAVE GENERATION CIRCUIT
5··· RESISTOR LADDER CIRCUIT
6··· LOW PASS FILTER
SW1～SW4··· COEFFICIENT GENERATION CIRCUIT

FIG. 18A

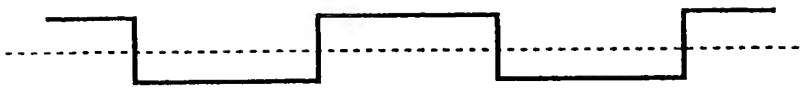


FIG. 18B

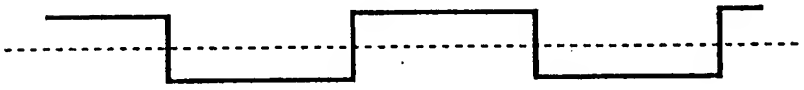


FIG. 18C

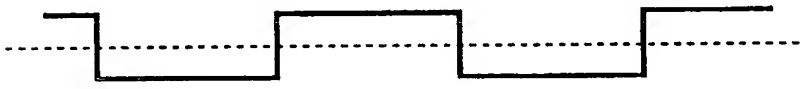


FIG. 18D

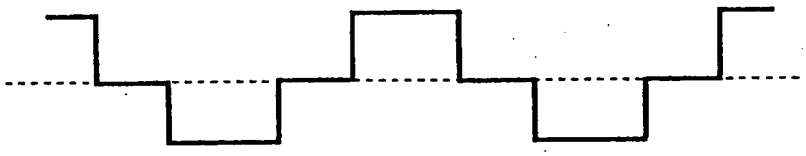
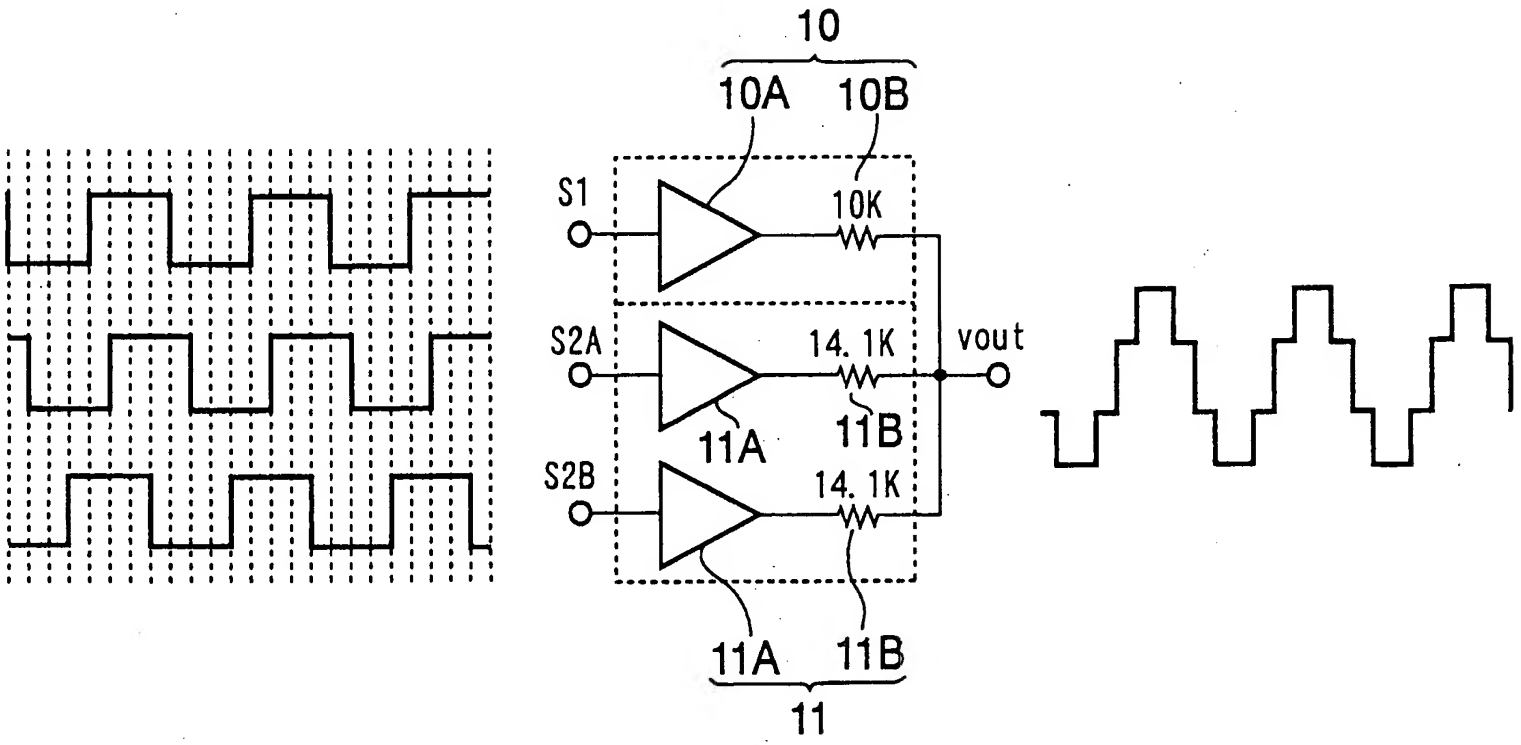


FIG. 19



10 ---- BINARY-VALUE GENERATION CIRCUIT

11 ---- TERNARY-VALUE GENERATION CIRCUIT

FIG. 20

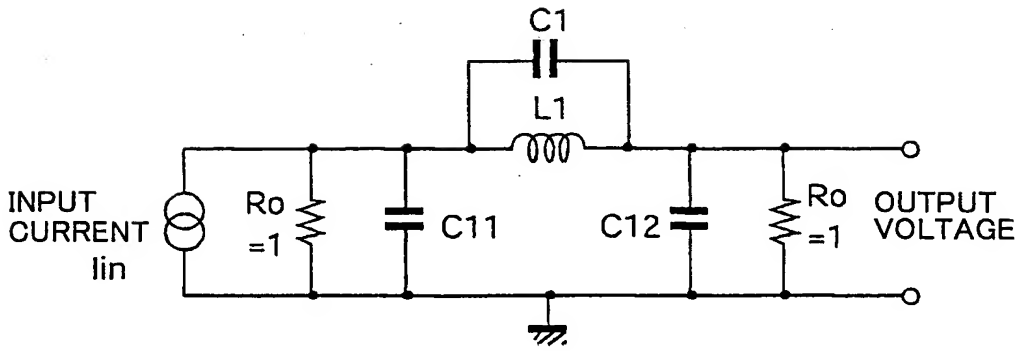

C1
L1
INPUT
CURRENT
Iin
Ro
=1
C11
C12
Ro
=1
OUTPUT
VOLTAGE

FIG. 21

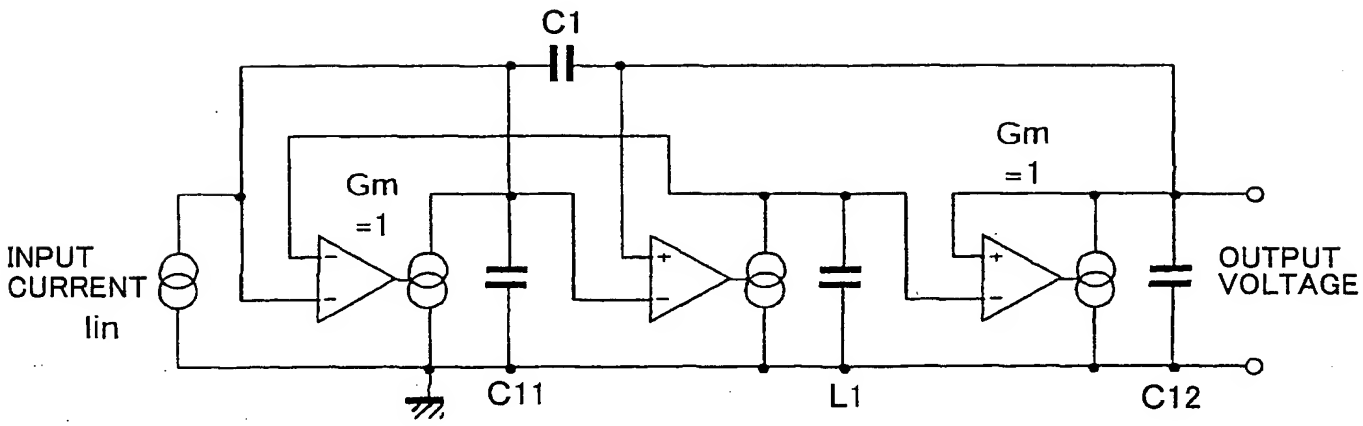

C1
Gm
=1
Gm
=1
INPUT
CURRENT
Iin
C11
L1
C12
OUTPUT
VOLTAGE

FIG. 22

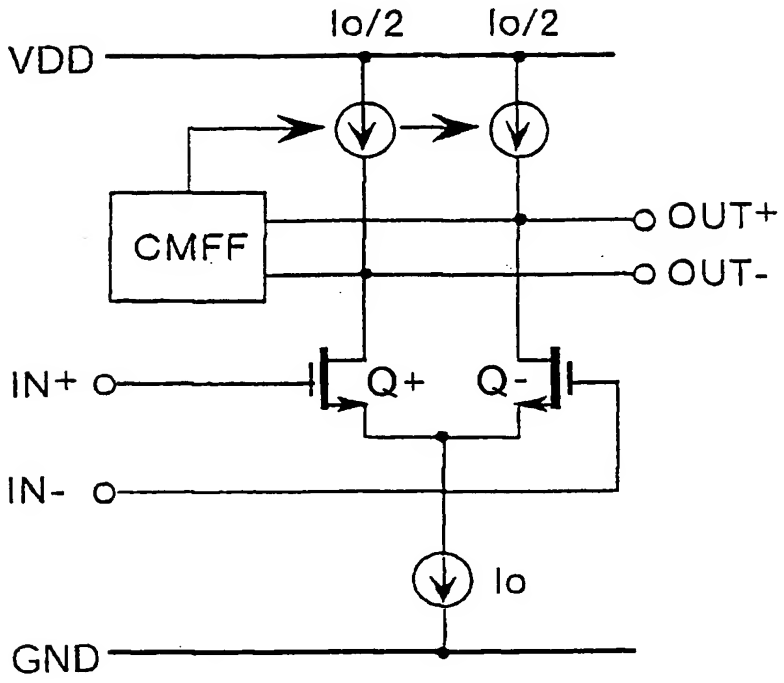

Io/2
Io/2
VDD
CMFF
OUT+
OUT-
IN+
Q+
Q-
IN-
Io
GND

FIG. 23

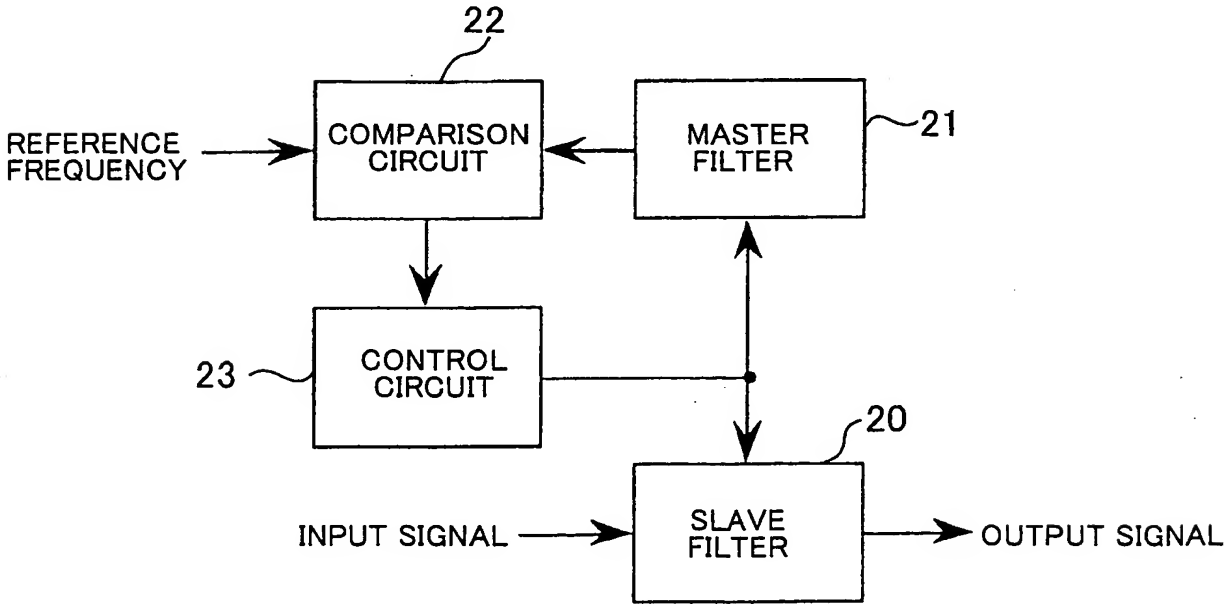

22
REFERENCE FREQUENCY
COMPARISON CIRCUIT
MASTER FILTER
21
23
CONTROL CIRCUIT
20
INPUT SIGNAL
SLAVE FILTER
OUTPUT SIGNAL

FIG. 24

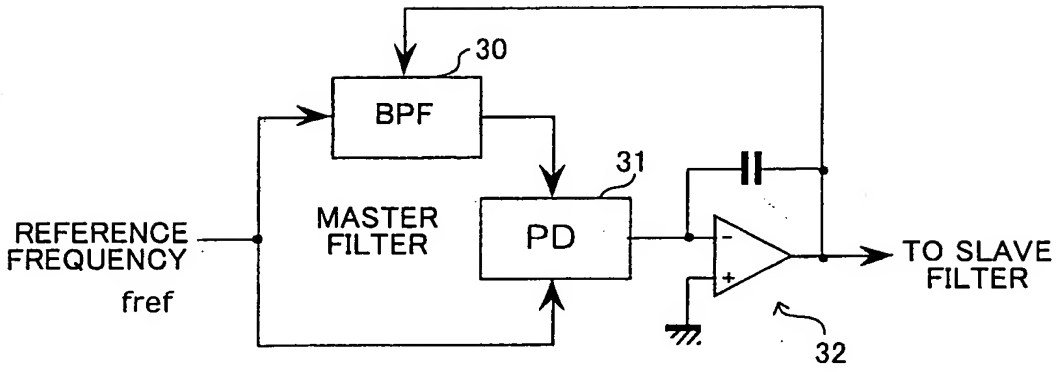

30
BPF
31
MASTER
FILTER
PD
REFERENCE
FREQUENCY
fref
TO SLAVE
FILTER
32

FIG. 25

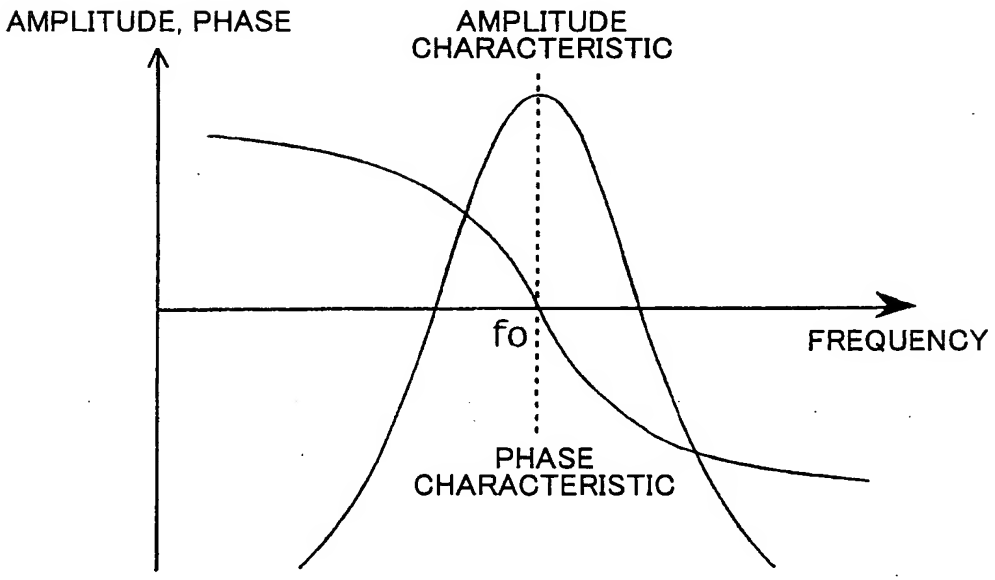
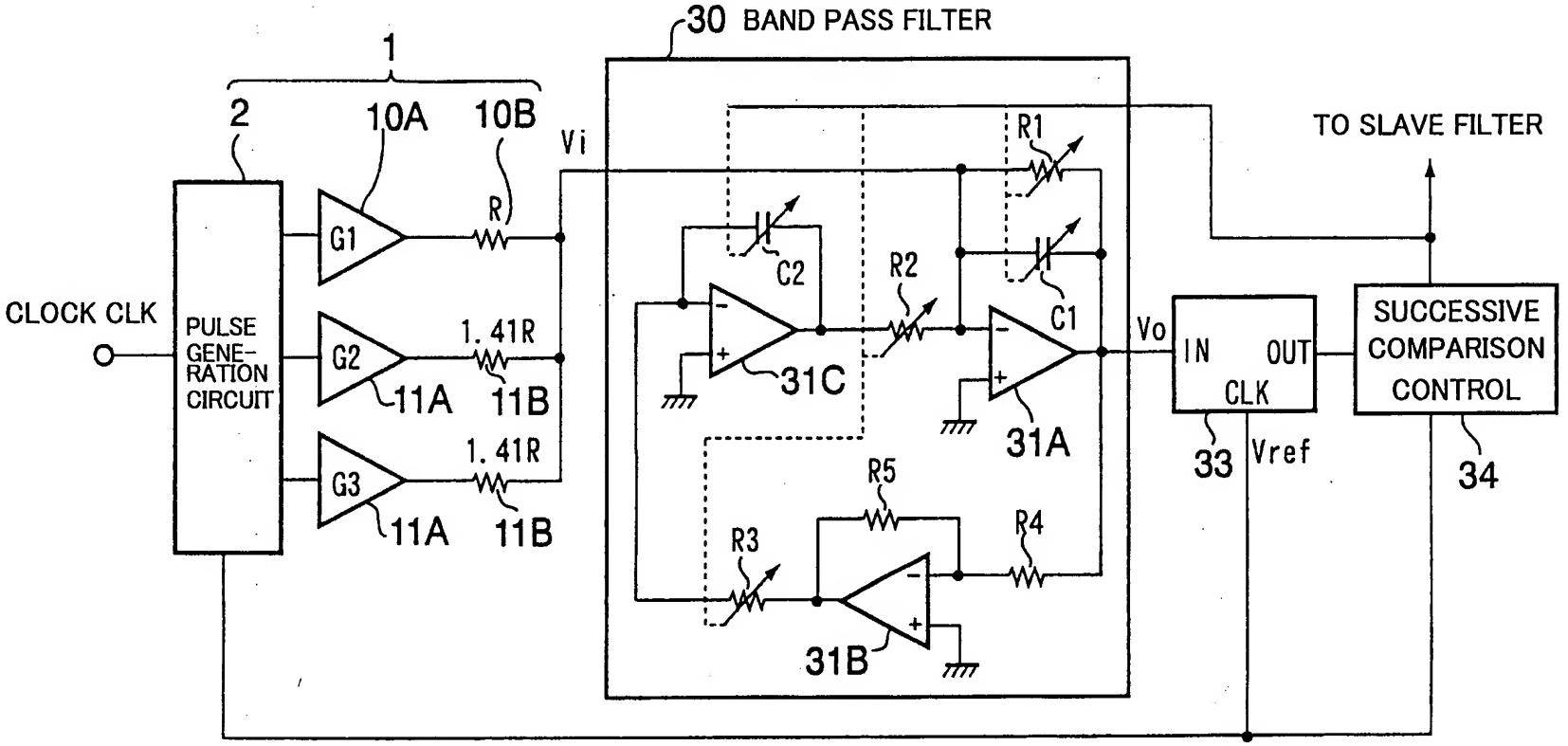

AMPLITUDE, PHASE
AMPLITUDE
CHARACTERISTIC
fo
FREQUENCY
PHASE
CHARACTERISTIC

FIG. 26



1 ---- SINE WAVE GENERATION CIRCUIT

10A~10B ---- BINARY-VALUE GENERATION CIRCUIT

11A~11B ---- TERNARY-VALUE GENERATION CIRCUIT

FIG. 27

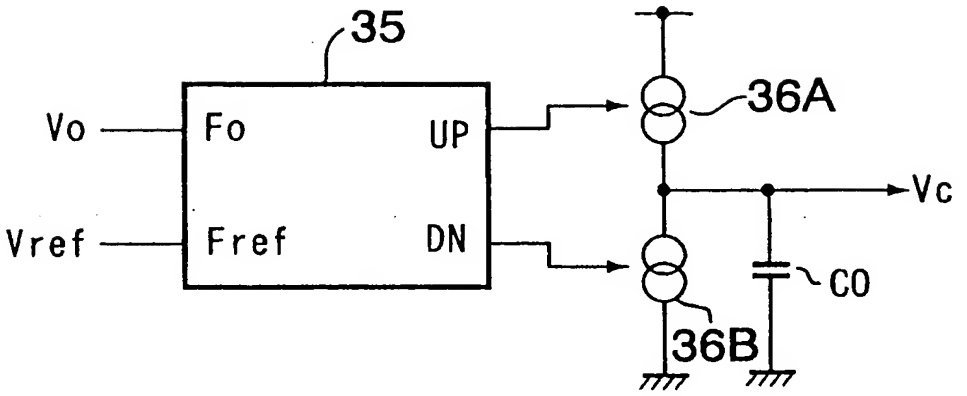
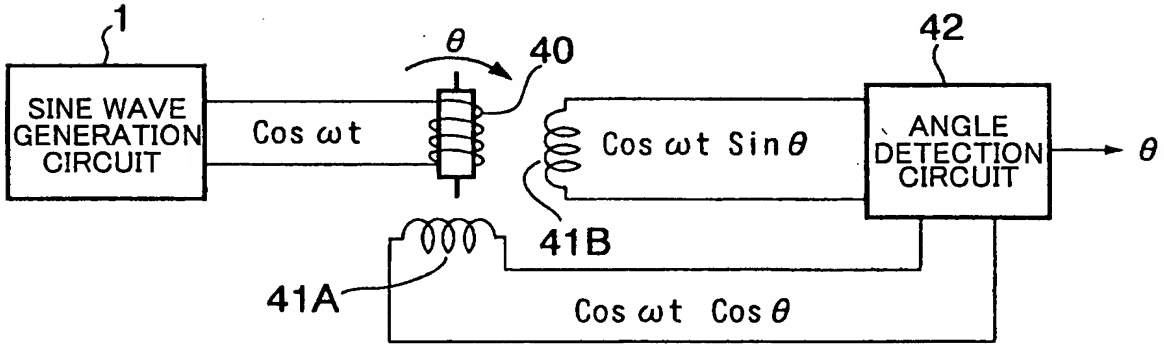

35
Vo
Fo
UP
Vref
Fref
DN
36A
Vc
CO
36B

FIG. 28


1
SINE WAVE GENERATION CIRCUIT
Cos ωt
θ
40
Cos ωt Sin θ
42
ANGLE DETECTION CIRCUIT
θ
41B
41A
Cos ωt Cos θ